



RESEARCH DEPARTMENT

Transmitting aerials for the Shetland v.h.f. television and v.h.f. sound station

TECHNOLOGICAL REPORT No. E-103

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**THE BRITISH BROADCASTING CORPORATION
ENGINEERING DIVISION**

RESEARCH DEPARTMENT

**TRANSMITTING AERIALS FOR THE SHETLAND V.H.F.
TELEVISION AND V.H.F. SOUND STATION**

Technological Report No. E-103
(1964/28)

D. Osborne, A.M.I.E.E.

W. Proctor Wilson
(W. Proctor Wilson)

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INTRODUCTION

The Shetland relay station came into operation on 1st April 1964. It provides a television and v.h.f. sound service to most of Zetland, to the south and south-eastern coastal areas of Yell, and to the southern parts of Fetlar and Unst.

SUMMARY OF INSTALLATION

Site: The site is at Ward of Bressay on the island of Bressay, about 2.5 miles (4 km) south-east of Lerwick, grid ref: HU/503387, height 743 ft (226 m) a.m.s.l.

Support Structure: The support structure consists of a 175 ft (53 m) square-section self-supporting tower, with a 48 ft (14.6 m) cantilever topmast. The tower is oriented with one side on a bearing of 15° ETN.

General Arrangement: See Fig. 1.

Band I

Channel: Channel 3, with vertical polarization is used. The vision carrier is offset -6.75 kc/s and the sound carrier -20 kc/s.

Aerial: The aerial consists of four tiers each of one vertical $\lambda/2$ dipole mounted on a bearing of 285° ETN and spaced 8 ft 10 in. (2.69 m) from the axis of the 4 ft (1.22 m) square tower section. The inter-tier spacing is 0.925λ and the mean height 140 ft (43 m) a.g.l. There are independent main feeders to each two-tier half aerial.

Power: Two 500 watt transmitters are used.

Templet and
Horizontal Radiation
Pattern (h.r.p.) See Fig. 2 and Note 1.

Gain:	Mean intrinsic gain	6.4 dB
	<u>Deduct:</u> losses due to distribution feeders and possible misalignment	<u>0.3 dB</u>
	Mean net gain	6.1 dB
	<u>Deduct:</u> loss in main feeder (type HM11)	0.5 dB
	network loss	<u>0.6 dB</u> <u>1.1 dB</u>
	Mean effective gain	<u>5.0 dB</u>

Band II

Carrier frequencies: 88.3 (Light), 90.5 (Third), 92.7 (Scottish Home) Mc/s.

Aerial: The aerial is mounted on a thin cantilever pole above the main support tower and consists of four tiers of dephased superturnstiles, i.e. each tier has four radial batwing elements fed with equal amplitude currents and having relative phases as shown in the following table:

<u>Bearing of wing</u>	<u>Relative phase, degrees</u>
44° ETN	45
134° ETN	0
224° ETN	225
314° ETN	180

The inter-tier spacing is 1.1λ and the mean height 199 ft (61 m) a.g.l. There are independent main feeders to each two-tier half aerial.

Power: Two 1 kW transmitters are used for each programme.

Templet and h.r.p. See Fig. 3 and Note 2.

Gain:	Mean intrinsic gain	6.3 dB
	<u>Deduct:</u> losses due to distribution feeders and possible misalignment	<u>0.2 dB</u>
	Mean net gain	6.1 dB
	<u>Deduct:</u> loss in main feeder (type HM11)	0.7 dB
	network loss	<u>0.9 dB</u> <u>1.6 dB</u>
	Mean effective gain	<u>4.5 dB</u>

Programme Links:

The television and v.h.f. sound transmissions from the Orkney station are received at a separate site (Fitful Head). The television programme (vision and sound) is then fed by a BBC microwave link to the Shetland transmitter. The v.h.f. sound programmes are fed to the transmitters by GPO line.

Notes:

1. The aerial design was based on a theoretical prediction of the h.r.p., assuming a cylindrical support mast electrically equivalent to the square tower section.
2. This aerial is an existing well-known type for which the h.r.p. may be calculated accurately.

ACKNOWLEDGEMENTS

The basic design of the Band I aerial was carried out by Mr. G.H. Millard and Dr. J.B. Izatt.

CHS

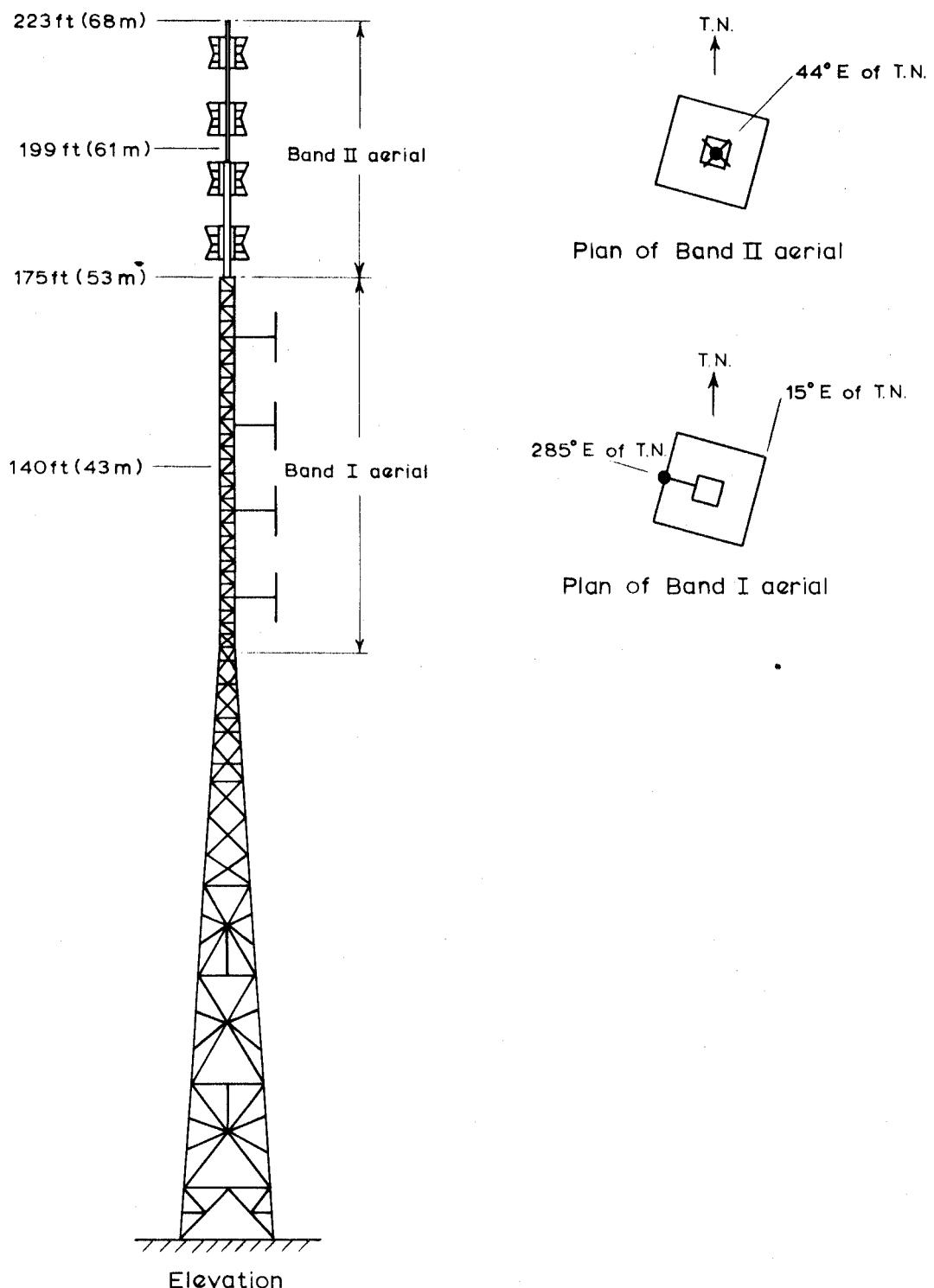


Fig 1 General arrangement of aerials on tower.

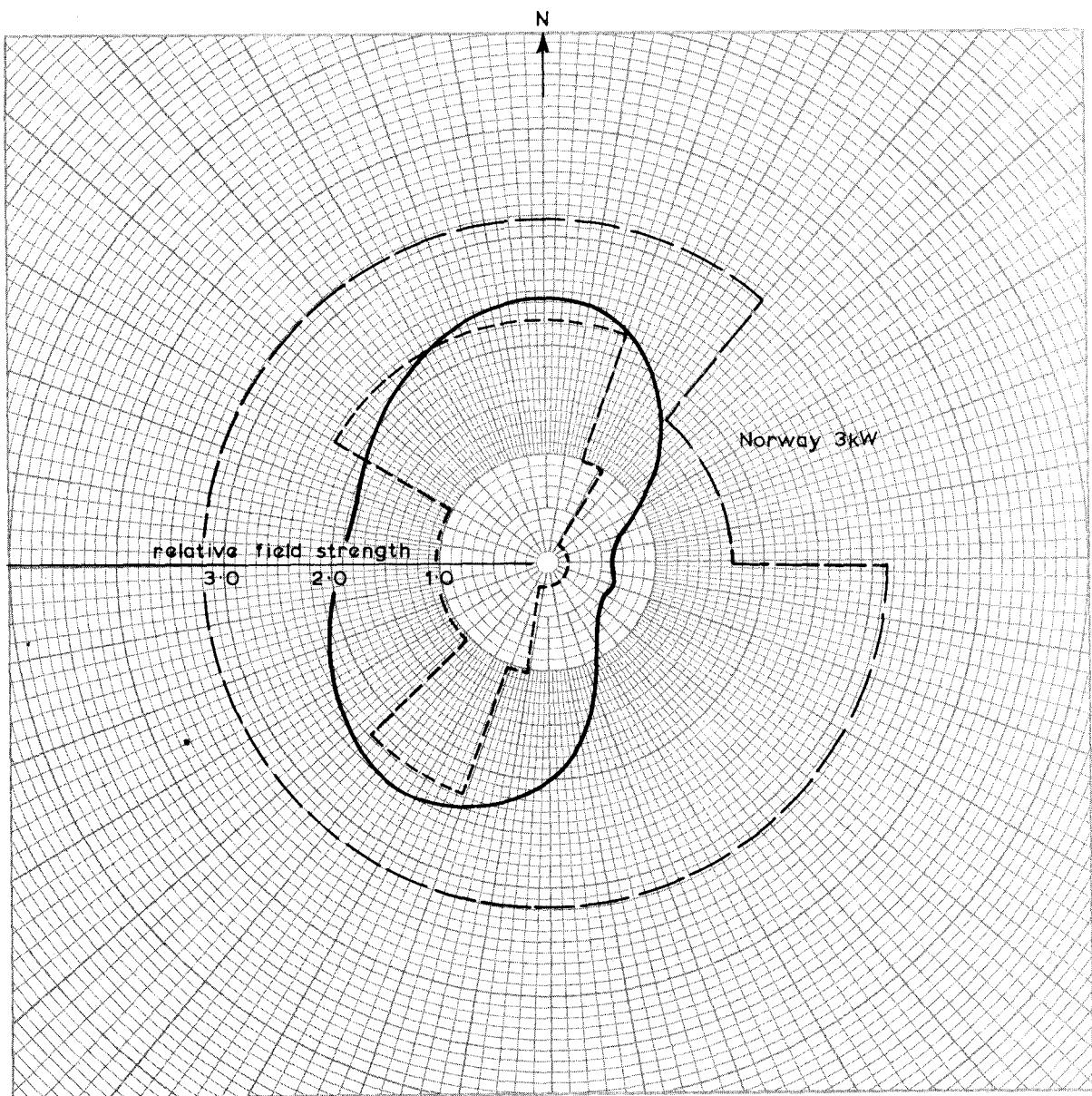


Fig. 2 Templet and horizontal radiation pattern of Band I aerial

Channel 3 (Vision carrier 56.75Mc/s Sound carrier 53.25Mc/s)

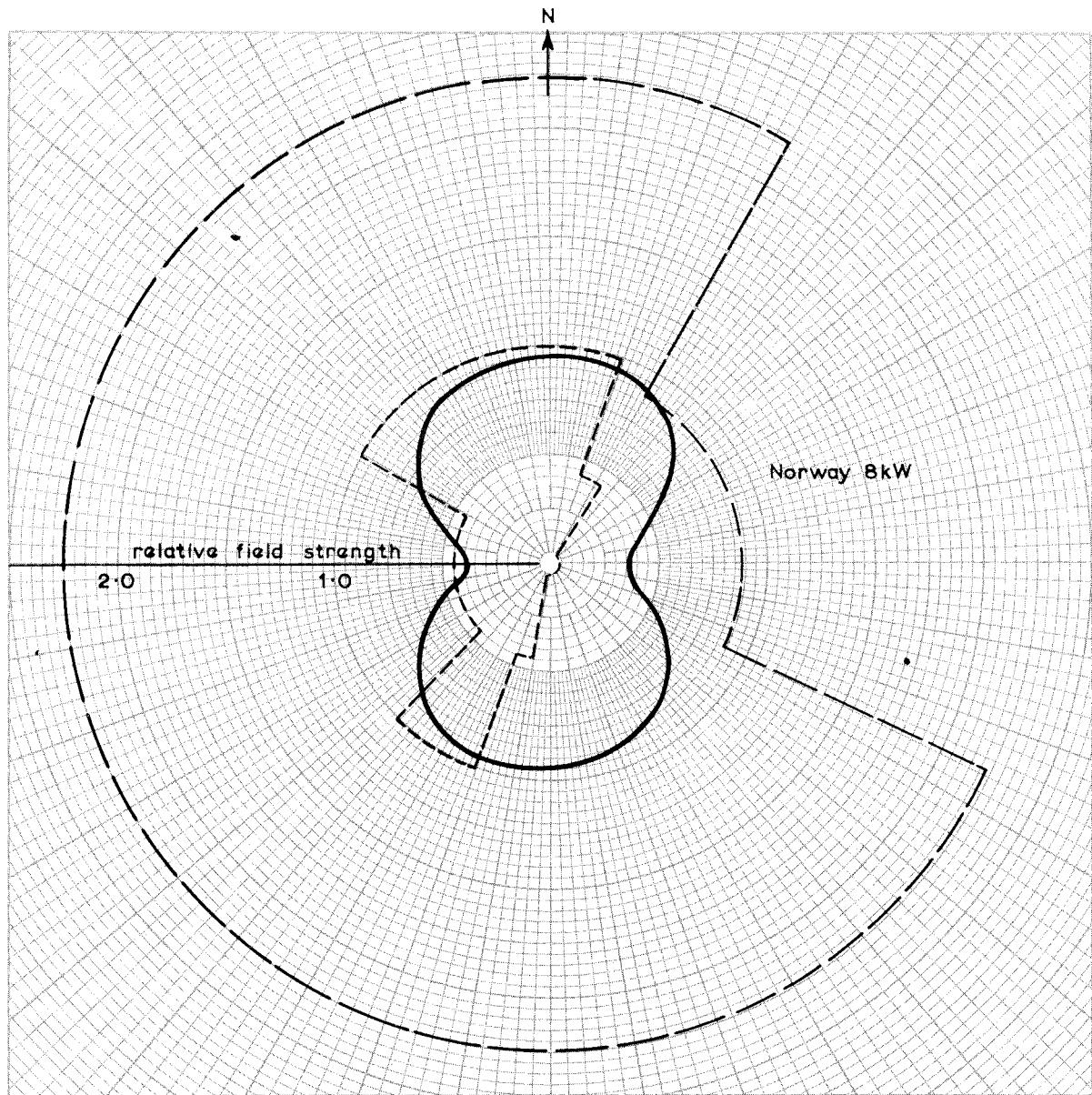
VERTICAL POLARIZATION

Mean effective gain 5.0dB — — Maximum permissible E.R.P.

Transmitter power $2 \times 0.5\text{kW}$ - - - - Minimum desirable E.R.P.

Mean E.R.P. 3.2kW

Unit field corresponds to an E.R.P. of 1kW



**Fig. 3 Templet and horizontal radiation pattern of Band II aerial
HORIZONTAL POLARIZATION**

88.3(Light), 90.5(Third), 92.7(Scottish Home), Mc/s

Mean effective gain 4.5dB

— Maximum permissible E.R.P.

Transmitter power 2 x 1kW

- - - Minimum desirable E.R.P.

Mean E.R.P. 5.6kW

Unit field corresponds to an E.R.P. of 10kW